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Increasing the number of spin-outs from Danish universities

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Executive summary

In this paper I describe some of the barriers and motivations involved in the process of creating spin-out companies from Danish universities - based on a study carried out at the Technical University of Denmark (DTU).

Even if procedures are established to support the spin-out process, there are still barriers that hinder the process. In this paper I investigate these barriers and the possible motivations that could increase the number of spin-outs. I also discuss some of the processes and tools that could be implemented to support the process.

Based on interviews with a number of stakeholders in the spin-out process the study reveals some of the barriers of the employees at the universities but also the other stakeholders view on the process. The investigation also reveals the various motivations for starting up a spin-out company and input to what the university/department can do to facilitate the process.

Introduction

Spin-out companies are one way of transferring the research based knowledge from universities to the society with intends of creating growth and value. There is however a number of barriers that hinders this process from happening. This is well-known in literature, but cultural differences across the world, will give different answers to the question: What are the barriers for creating more spin-outs? In this paper, I seek to describe what these barriers are and what motivates researchers at Danish universities to go into a spin-out venture, with special focus on The Technical University of Denmark (DTU). Innovation at DTU is seen as an equal activity in relation to research and teaching and one part of the innovation activities is the formation of spin-out companies. In the past few years, there have been a very sparse number of companies formed from DTU. This can be explained by the general financial decline reducing the risk-taking capital, but human factors are also present. The companies started has typical been driven by a typical entrepreneurial spirit, but a number of researchers at the university could also be potential entrepreneurs - at least based on the applicability of their research. So it is interesting to know, why they don't take the step into a spin-out company (given that the appropriate funding is available).

I will claim that there is a large un-discovered potential that is not exploited within the current system and procedures. This paper discusses the barriers and motivation of the stakeholders at DTU. This has been done through interviews with a range of stakeholders in the spin-out process: Current employees, PhD-students, former employees who switched to spin-out companies, entrepreneurs who have started a spin-out company themselves, the management level at DTU and investors/advisers. In addition to a picture of the barriers experienced by the department employees I also include the other stakeholders' picture. I have also tried to reveal the individual groups motivations to start a spin-out company, and their input into how the department (or university) can contribute to help the process along.

Data collection

The stakeholders have been interviewed based on a few basic questions related to their specific relation to the spin-out process. Employees (former and existing), students and entrepreneurs were asked about the barriers and possible motivation they experience in the process of spin-out ventures. Also their suggestions related to how the department/university could facilitate the process. The management level at DTU was asked about the strategy and supporting procedures for spinning out companies, and the investors/advisers were asked about the barriers that they had identified. All interview persons are of Danish heritage to rule out any cultural differences.

The political stakeholders were not included in this investigation since they are not directly involved in the process. However, they do set the overall frame wherein this happens. Students at bachelor and master level has also been excluded since only in very few cases they have made inventions that could be basis of a spin-out company, and are also quite early in their careers.

The answers from the different categories have been grouped in three main categories: Barriers, Motivation, and the Role of the department/university. Within each category the answers have been grouped in different themes.

Results

In the following the results are presented - both the aggregated results and the individual categories results.

The following *Barriers* were identified by the various stakeholders: Economical uncertainty, In-ability to return to the university, cultural resistance, difficulties in attracting money, insufficient competences, Intellectual property rights unknown, the security and freedom at the university, lack of knowledge and understanding of the spin-out process, technological uncertainty, and system and politically determined barriers.

The following *Motivations* were identified: Economical attractiveness, the possibility of returning to the university, the challenge/independence, expectation of success, if the right competences are available, and continual contact to the university.

Finally, the main themes related to the *Department/university role* are: Proof-of-concept, possibility to take leave (and be able to return), education, processes and procedures, economical, technical or administrative support, networks and informal collaborations, strategic measures, and external advisory.

The importance of the different factors has been measured by the number of statements within that factor from the different stakeholders. It is illustrated in Figures 1, 2 and 3.

For the *Barriers*, the four main issues are: difficulties in attracting money, lack of knowledge and understanding of the spin-out process, cultural resistance, and the security and freedom at the university. See Figure 1.

As for the *Motivations*, there are three main issues: The possibility of returning to university, the challenge/independence, and the expectation to success. See Figure 2.

The respondents' main issue related to what the *Department/university role* could be was dominated by one thing: Education. See Figure 3.

It is interesting to see if the barriers, motivations and suggestions for university/department role are the same across the different stakeholders. In Figure 4 the individual stakeholders' responses are displayed for the topic *Barriers*. As can be seen, for the existing employees the main barrier is the security and freedom at the university, whereas this is not an issue for any of the other stakeholders. The employees also see the lack of information on what the spin-out process requires as a barrier - an observation the investors/advisers also have as an important barrier.

The *Motivation* for starting a spin-out company shows one very remarkable result, namely that the employees would be very motivated to go into a spin-out company, *if* they have the possibility to return to the department/university again (see Figure 5). At the same time they are also motivated by the expectation to success and the possible economical outcome. The entrepreneurs are mainly motivated by the challenge/independence whereas the former employees are motivated both by the challenge/independence but also that they see the right competences present.

The individual responses for the *Role of the Department/University* are very different for the different groups (see Figure 6). The employees will like to have strategic measures, processes and procedures, and more education. The entrepreneurs are mainly interested in economical,

technical or administrative help. The management level will like more education and processes and procedures and the investors/advisers see education as the main issue.

In the following the results will be discussed in more detail.

Discussion

As the chart shows the barrier which employees perceive strongest, is security and freedom at the university, clearly because this is the career path these persons have chosen and is in the middle of. Neither entrepreneurs nor investors see this as a barrier. For the entrepreneurs, this may not be surprising since he/she already has taken the step away from the university. And the investor/advisors often only meet entrepreneurs who have taken the decision to start a business, and will therefore not see so many potential entrepreneurs who would prefer to stay at the university.

What is surprising is that the leadership level at DTU does not focus on this parameter. This could indicate a lack of alignment between management and employees - with respect to what motivates the researcher. An opinion from an institute director was that "*associate professors and assistant professors cannot leap from an academic career to an industrial career*" and "*it is not the same people who will do research and do business.*" One employee said that he had invested much time in his academic career, and felt unsure of what could happen if he left university. Only one employee said he did not want to start a business venture - the rest expressed interest. This indicates that employees do not feel it's impossible to switch from academia to industry, while, at least parts of the leadership level at DTU not see this as a possibility. The employees' viewpoint is also supported by several international investigations^{1,2,3} showing that successful scientists often are skilled entrepreneurs.

The fact that you can not return to the department/university is only a barrier to employees and management, although it is not a dominant barrier. The persons who have left the academic career and students who have not yet built one, have not seen it as a barrier. It is in this context interesting to note that the ability to switch between an academic and industrial career is expressed to be interesting for all interview groups.

For entrepreneurs, the management level and investors/adviser significant barriers are also "cultural resistance" and "funding uncertainty". That it is not seen as a barrier for employees can be attributed to the fact that they have not yet been active in the process and therefore have not experienced the challenges. The management level, investors/adviser and entrepreneurs have obviously been involved in the process and therefore have a more practical picture of the situation.

A possible solution to the barrier for researchers is to use so-called surrogate entrepreneurs⁴, representing exogenous entrepreneurs who take over the idea from the university and pursue it within a spin-out company. The researcher can then get at consultancy role or a temporary partnership in the spin-out company. Several of the interviewees have expressed a desire to do this, and it is another way to mix academic and professional careers. The new funding possibility from the Danish National Advanced Technology Foundation (*Højteknologifonden*) for an Industrial PostDoc⁵ is one way of pursuing this.

As shown in Figure 5 the crucial motivation for the employee to take the step, is if there is a

¹ Philippe Mustar, Mike Wright, Bart Clarysse, *University spin-off firms: lessons from ten years of experience in Europe*, Science and Public Policy, **35** (2), (2008), pp. 76-80

² Réjean Landry, Nabil Amara, Imad Rherrad, *Why are some university researchers more likely to create spin-offs than others? Evidence from Canadian universities*, Research Policy, **35**, (2006), pp. 1599-1615

³ Einar Rasmussen, *Spin-off venture creation in a university context – an entrepreneurial process view*, presented at 14th Nordic Conference on Small Business Research

⁴ Stephen J. Franklin, Mike Wright, Andy Lockett, *Academic and Surrogate Entrepreneurs in University Spin-out Companies*, Journal of Technology Transfer, **26**, (2001), pp. 127-141

⁵ http://hoejteknologifonden.dk/for_ansoegere/erhvervspostdoc/

possibility to return to the department/university. This has not been mentioned by any of the other groups. If we compare with the largest barrier for the employees, it was just security and freedom at the department/university. That you are motivated by being able to return may indicate either that you are happy with your work or that you need the reassurance and security offered by the system, or simply the uncertainty of trying something new. Neither the entrepreneurs, nor the former employees or the students expressed that being able to return was a motivation. As for the Barriers it can be argued that this is due to the fact that the two first groups have already left the university and the student has not yet created a career and therefore are completely open to the possibilities that present themselves.

The departments/university's role in the spin-out business process is weighted quite differently from the different interview groups, but overall education is one of the important issues for almost all groups, except the entrepreneurs. But the entrepreneur has the almost *per se* already the skills required - at least in his/hers own perception. The strongest advocates for more education are investors, and thus a clear indication that education in entrepreneurship is not strong enough. One investor said that "*The raw material is simply too weak - it's random what comes out*", understood as the human raw material within entrepreneurship.

The entrepreneur, by contrast, is most in need of assistance either of economical, technical or administrative nature. This is interesting in the research policy perspective - what is most needed by small startup companies is a reduction of economic and administrative burdens.

There is not necessarily a general agreement on whether universities should provide special support to spin-out companies. Warwick Ventures, a department at the University of Warwick, England, responsible for identifying and commercializing ideas from the university, has clearly the position that the university should not help funding spin-out companies - if they can not find external money by themselves it is because there is no market, and everyone is best served by the company closing⁶. Whether this is true for high tech companies where development costs are quite high compared to, for example, software development companies are in this author's opinion, questionable. And the tax laws of England are also quite different from the ones in Denmark, making a direct comparison difficult.

One way to solve the problem of education could, as mentioned previously, be to involve an exogenous (surrogate) entrepreneur. This has the advantage that one can choose people with the right skills - both technical and commercial. The challenge will be to match the external person and the idea. One of the interviewees said that "*Matchmaking is incredibly difficult but could be extremely interesting*" and suggests using Alumni Networks as a possible way of interacting. However, the use of exogenous entrepreneurs needs to be seen as complementary to more training at the department/university.

Among the interviewees neither the current employees, students, staff in the spin-out companies or (except one) entrepreneur had a typical entrepreneur personality. There was no one who urged to start up a business and throw all safety overboard and focus only on the good idea. As one investor said it was "*very random what came out of DTU*" (and most likely also from other Danish universities), and this is supported by the interviews. What in this context is interesting, that two of the three entrepreneurs interviewed got to be entrepreneurs almost by chance. We should therefore ensure that these kind of "chances" occurs with much greater frequency than today - we must recognize that the Danish educational culture (and it is already from basic school) does not encourage the entrepreneurs, but given the right circumstances, it is nevertheless possible to provide a basis for forming spin-out companies. We must, in other words try not to copy, e.g. an American model, because we are culturally at a completely different place, and thus will not be able to adapt other countries' processes or incentive structures.

My conclusion is that we must accept the Danish culture and adjust the processes to fit if we

⁶ Ederyn Williams and Isabell Majewsky, *Academic spin-off companies: Myths and pitfalls*, from *Infrastructures for Academic Spinoff Companies*, Sidje et al. (Eds.), 2002, University of Twente

need more spin-out companies to be formed. However, we must not hinder the “real” entrepreneurs and therefore the process should not be too rigid and bureaucratic, but be open offers to students and employees.

Conclusions

One of the main issues for almost all the stakeholders is the lack of education within entrepreneurship. It is therefore one activity that can be increased at department/university level. Not only is an increased education activity at the graduate level needed, but also a general educational activity for the employees.

More education at graduate level does not necessarily mean more courses, but could e.g. be to invite entrepreneurs into a lecture in cases where the specific company's activity fits with the subject of a course. The students will thus be able to see how an idea within the current subject they learn about, can result in a company and maybe get some input into what it takes to translate an idea into practice.

Another activity is e.g. Venture Cup⁷. One of the interviewees said "*The competition element where you can win money is insanely interesting*", so if you can support this widely through the education, I believe more students will see entrepreneurship as an exciting challenge, e.g. small department related "Venture Cup" contest with a focus on concrete projects and inventions from the department. This could also be defined as summer schools for PhD students.

The general awareness of entrepreneurship among employees is today mainly through historical examples. But there is a need for more knowledge of the area. One input from the interviewees was to invite people with experience in a spin-out company (both positive and less positive experience) to talks, and thereby gaining a better understanding of what it means to start a business and thereby possibly lower the barriers.

As has been mentioned a few times, the Danish culture - at least as expressed through interviews - is very security seeking. I think it would be very difficult if not impossible, to change the culture through actions at the universities. I believe we must accept this situation and adapt the efforts accordingly. One of the biggest barriers was that it is difficult to get back to the university once you have left for at spin-out. And it is also a great motivation that you have the opportunity to get back to university again if it goes wrong. In addition, a large proportion of the interviewees had a wish to alternate between an industrial and an academic career.

So to strengthen the motivation to engage in a spin-out adventure, we should try to make it easier to return. This will also lower the barrier of not being able to return. One of the concerns that several interviewees expressed, is the fact that being away from the university for just a few years and not publishing, makes it difficult to apply for funding from e.g. the Danish Research Councils. Here the focus is mainly on the number (and quality) of publications and your particular research activity. Therefore, one of the challenges for a person coming back to university after a career in business is to resume the publication activity. For the department is not necessarily a problem that the person has had a period without publications, since he can bring other experiences. But as more and more of the departments (and universities) funding is from external competitive sources, it is important that all employees can help to pull this kind of financing home. So to regain a career in research it is necessary to have a "grace period" where a former industry employee can rebuild his career in research with publications. This period must be funded and it would be natural to be managed centrally at the university. However, this requires additional funding to the university.

An alternative solution to this problem could of course be that the evaluation criteria of the Danish Research Councils are revised and the councils are forced to bring an overall assessment of applicants, so it is not only publishing activity that mainly determines who should receive funding. This can be an input to the research policy debate.

⁷ www.venturecup.dk

In literature on new product development one often refers to "The Valley of Death"⁸ or less dramatic, "The Entrepreneurial Zone" describing the transition from idea generation and incubation to acceleration and product development. In the case of spin-out companies from universities the situation is even more difficult than in a private company because the idea generation and product development takes place in two completely different organizations (the idea generation takes place at the department/university and the product development takes place in the spin-out company). Therefore it is extremely important that this transition be as easy as possible, for example that the spin-out company does not use all the start-up resources to establish Proof-of-Concept of an idea. One investor pointed out specifically that this is in fact often the case. Therefore, more funds are needed to this part from the public side. This is also an input to the research policy debate since the departments/universities have no such special funds.

But the department could impose a pre-Proof-of-Concept environment. Proof-of-Concept funding is given only to ideas which are patented (or at least where there is a filed patent application). But before an idea is ready for Proof-of-Concept funding it often requires that more detailed measurements are carried out, or a theory are verified experimentally. This requires special funds not currently existing within external sources. These funds could be allocated from a central source to help these incubator ideas.

I have in this paper tried to describe the barriers and motivations specific to the Technical University of Denmark for establishing more spin-out companies from universities. I have also identified some of the possible supporting measures the departments/university can implement to increase the number of spin-out companies. The elements identified are as follows:

- More education within entrepreneurship, for both students and employees
- Special leave arrangements, so it is possible to return to the university (if needed)
- Special funding to support returning employees and give them a "grace period" to re-establish the research activity
- Revision of the evaluation criteria in the research councils
- More funding for Proof-of-Concept projects
- Local incubator funds at the university
- Less administrative and financial burdens for spin-out companies
- Matchmaking between exogenous entrepreneurs and ideas from the university

It will require active involvement from both the departments, the university and from the political system to get all these elements implemented. It also requires an overall evaluation of the economical aspects of the whole process. Spin-out companies are only one part of the knowledge distribution from the universities, and it is not clear yet, what the long term consequences are. It is therefore also a political decision, whether spin-out companies are an important element of the future growth potential.

⁸ Markham, S.K., "Product Champions: Crossing the Valley of Death," In P. Belliveau, A Griffen and S. Sorermeyer, eds. *PDMA Toolbook for New Product Development*. New York: John Wiley and Sons, 119 - 140, 2002





